KRISHNARAJA SAGARA RESERVOIR

ACROSS THE

CAUVERY RIVER IN MYSORE TERRITORY

SUGGESTIONS FOR COMPLETING THE WORKS AND DEVELOPING IRRIGATION AND POWER SUPPLY

BY

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FOREWORD.

THE materials for this memorandum have been ready for some time and I have taken advantage of the first few weeks of leisure I could get to put them into shape for future reference and use. This has been done in close consultation with Mr. K. Krishnaiengar, Chief Engineer, Cauvery Valley Irrigation, and I have also received much help from Mr. M. G. Rangaiya, who, as Under-Secretary to Government, was on duty with me till I laid down office last month.

M. V.

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KRISHNARAJA SAGARA RESERVOIR.

1. PRELIMINARY.

In a report dated 5th May 1911 (since reprinted), a description of the Mysore Cauvery Reservoir Project was given by me in my capacity as Chief Engineer of the Public Works Department.

The reservoir has come to be known as "Krishnaraja Sagara" in commemoration of the sanction by His Highness the Maharaja Sri Krishnaraja Wadiyar Bahadur, G.C.S.I., G.B.E., to whom the work owes its inception.

The project was sanctioned in October 1911 and work on the reservoir dam commenced in the month of November of the same year.--In these seven years, the works have made satisfactory progress, more than two-thirds of the masonry for the full stage dam having been already completed. Several minor canal works in the valley of the Cauvery River, rendered possible by the construction of the reservoir, have been executed and opened for irrigation. What remains now is the construction of a high level canal on the left bank of the river, and the improvement, control and better administration of irrigation in the whole of the river valley. These large works cannot be pushed forward until a final decision is given by the Secretary of State for India on the Mysore-Madras Cauvery Arbitration Case.

Object of this memorandum.

2. It is proposed in this memorandum to briefly review the progress so far made on this important project and to outline a programme for completing the dam and all subsidiary and allied works. The policy to be followed in the matter of the development of irrigation and of electric power will be briefly indicated, and a financial forecast given of capital expenditure and anticipated revenue, as far as can be judged from present conditions.

2. REVIEW OF WORK DONE.

3. As may be seen from the printed report referred to above, the reservoir was projected in two stages. In the first stage the dam was to store 80 feet of water above the bed or 11,030 m.c.ft., and in the second or final stage, 118 feet of water representing 37,080 m.c.ft. above sluice level. The reservoir in the first stage was intended to supplement the river flow in summer months for guaranteeing the power till then supplied to the Kolar Gold Mines, *viz.*, 9,321 H.P., as well as for generating an additional 5,000 H. P. required by them, besides providing water supply to about 25,000 acres of new irrigation in the Cauvery valley.

4. The first stage of the Krishnaraja Sagara Dam was sanctioned in Government Order No. C. 13-19—84-90, dated 12th October 1911, at an estimated cost of Rs. 81 lakhs. In conjunction with this work, a fourth installation of the Cauvery Power Scheme estimated to cost Rs. 8 lakhs was also sanctioned with the object of giving to the Mines the additional supply of 5000 H. P. referred to above. Immediately after, a Construction Division was formed with Mr. B. Subba Rao as Superintending Engineer in charge. The Government were under a contract with the Mining Companies to guarantee their power supply from 16th July 1915 and the dam had to be raised to a sufficient height by that date for fulfilling the guarantee. It is satisfactory to record that this was done and the Government were enabled to fulfil to the letter their obligations to the Mining Companies.

Reservoir Dam.

5. The excavation, clearing and unwatering of foundations for the masonry dam was no easy task, as a big river had to be dealt with and no work could be executed in the river bed for at least six months of the year, during which the river carried a discharge varying roughly from 6000 to 150,000 cusecs. Sound rock particularly towards the north bank was found at much deeper levels than were originally anticipated from the preliminary trial pits taken before commencement of the work. An increase in cost was the result, not only on account of increase in quantity but also of higher rates that had to be paid for work at deeper levels. This unforseen cause as well as the outbreak of the European War in July 1914, and the speed with which the work had to be pushed through to fulfil the obligation to the Mining Companies, all served to increase the cost of the dam and, accordingly in the year 1916, Government had to sanction a revised estimate for Rs. 103·42 lakhs.

6. The first stage length of the masonry dam was 4,200 feet, but the length of foundations actually laid up to end of June 1918, *i.e.*, to end of official year 1917-18, was 5,150 feet. This includes provision for a portion of the work needed for the second stage. The dam has been taken to a height of 60 feet (the front edge has since been further raised to 63 feet) in the river bed portion extending over a length of 894 feet. The flanks immediately on either side were raised to a height of about 90 feet and towards the extremities, to 50 feet.

The quantity of masonry built to end of June 1918 was 19·15 million cubic feet against 28 million cubic feet required to complete the dam to its full height, showing that nearly 70 per *cent.* of the work for the final stage is completed.

7. Eight Stoney's patent scouring sluices, each 6′ × 12′, have been built in the body of the dam in the southern half of the river bed at 12 feet above bed level. The project provided for fixing only six sluices at this level, but the number was increased to eight at the special request of the Madras Government to enable us to pass the limit quantity due to them when the reservoir level is low. Two irrigation sluices 4′ × 8′ have also been built with sill at 40 feet above bed, to feed two small low level canals constructed on either side of the river.

8. Four penstock pipes of 6 feet diameter, for generating power with the aid of water issuing from the reservoir, are also being built in the body of the dam on the left or north bank with their centres at 53 feet above bed. The head available for power generation will vary from 103 to 58 feet as the water level in the reservoir falls from its maximum height to the minimum.

Land Acquisition and Settlement.

9. As a large extent of cultivated land was coming under submersion by the reservoir and as many as 17 villages with a population of about 10,000 would get drowned eventually, Government thought it advisable to provide the expropriated raiyats with new land in the vicinity, which could be cultivated and partly irrigated, instead of giving them money compensation. A scheme was worked out by the late Mr. L. Krishna Rao, who was appointed Special Land Acquisition Officer for the purpose, and it received the sanction of Government in May 1913. As a result of that scheme,one new channel and extensions of two old channels for which projects estimated to cost Rs. 21·43 lakhs were ready, were sanctioned. The extent of new land to be brought under cultivation by these channels was 20,300 acres, against about 11,000 acres of wet and garden land to be submerged by the reservoir when completed to the full height. As some of the lands commanded by these channels were considered too far for the expropriated raiyats to take up, the two new low level canals referred to in paragraph 7 above were also sanctioned.

10. The operations under the land acquisition and settlement scheme may be briefly summarised here. The total extent of lands submerged by the first stage is 10,814 acres. Of this, an area of 9,542 acres has been acquired. The lands granted in exchange up to June 1918 aggregate 9,196 acres. The total expenditure in cash under all heads has till now amounted to about Rs. 7,60,400, as against a provision of Rs. 10·77 lakhs in the estimate for the first stage. Several new villages have been built and others are being formed in the tracts in which new lands have been allotted to the expropriated raiyats. Estimates, aggregating Rs. 1,05,000, were sanctioned for building new temples in place of the old ones of the Kannambadi village submerged by the reservoir.

New canals above and below the reservoir.

11. Three channels above the reservoir, namely, the extensions of Mandagiri and of Hemagiri channels, and the new Chamaraja right bank channel, were fully or partially opened for irrigation by June 1918. The two low level canals taking off from the reservoir were also opened for irrigation by the same date. The expropriated raiyats, who have been granted lands below all these channels in exchange for those submerged, brought a considerable area of the former under irrigation during the year 1917-18.

12. The following table gives the more essential particulars concerning these channels:—

Canals	Extent of old irrigation	Extent of irrigation proposed	Estimated cost	Actual expenditure to end of 1917-18	Area cultivated in 1917-18	Net additional revenue	
						Realised during 1917-18	When completed
Old Channel Extensions.	Acres	Acres	Rs.	Rs.	Acres	Rs.	Rs.
1. Hemagiri ...	1,381	899	95,200	96,037	899	4,490	4,720
2. Mandagiri ...	3,043	6,672	6,67,296	5,52,157	2,126	6,300	31,447
New Channels.							
1. Chamaraj Right Bank.	...	12,714	14,29,704	13,28,078	3,640	14,500	57,442
2. Low Level Canals—Right.	...	3,150	2,14,130	1,58,664	700	2,111	12,164
3. Do Left ...	...	1,400	1,37,141	1,00,815	575	...	7,278
Total ...	4,424	24,835	25,43,471	22,35,751	7,940	27,401	1,13,051

These channel projects have not only made available sufficient land for exchange but they also promise to prove highly remunerative in themselves.

Power Development.

13. The preliminary estimate for the IV installation of the Sivasamudram Falls (Cauvery Power Scheme) first sanctioned for Rs. 8 lakhs was subsequently found to be inadequate for several reasons. A revised estimate was sanctioned for Rs. 14 lakhs and this was subsequently raised to Rs. 21 lakhs. Of this latter amount, nearly Rs. 6 lakhs have been realised by the sale of surplus materials replaced by the IV installation and the net expenditure on the works to end of December 1918 has been Rs. 14,17,220.

14. This installation has increased the output of power at Sivasamudram from about 16,500 H. P. to 18,650 H. P. and the plant was brought into operation from July 1915. The fifth installation works estimated to cost Rs. 3·68 lakhs sanctioned to meet additional demands for power are also in progress. This will further raise the total generating capacity to 22650 H. P. The additional net revenue realised at present, in consequence of the increased supply of power from the fourth installation and the enhanced rate of £ 12 per H. P. on the original power guaranteed, is about Rs. 7 lakhs per annum. When power from the fifth installation, which is yet unutilised, is also taken up, the additional revenue will increase to about Rs. 10 lakhs. These extensions to the power scheme have been rendered possible only by the construction of the reservoir.

Returns already secured.

15. The storage already secured has thus served to guarantee, from 15th July 1915, electric power up to 9,321 H. P. supplied to the Gold Mining Companies from the first three installations at Sivasamudram, as well as to generate additional power to the extent of 5,000 H. P. The generating capacity of the station has risen from about 13,500 H. P. to 22,650 H. P., as stated above. The net total revenue from the Cauvery Power Scheme during 1917-18, after deducting working charges, amounted to Rs. 11,27,833. Of this, a sum of Rs. 3,08,177 was credited to the Reservoir account, bringing the total amount

so credited from July 1915, the date from which the guarantee was given and reservoir power made available, to Rs. 10,33,310. The method of calculation laid down in G. O. No. Fl. 6910-12—G. F. 235-16-2, dated 4th May 1917, for the distribution of revenue between the reservoir project and the Cauvery Power Scheme, is not satisfactory and requires re-examination to ensure a more equitable distribution between the two projects.

16. Investigations are on foot for extending the cultivation of sugarcane on the "block system" under some of the existing river channels situated below the reservoir. A levy of an extra water rate of Rs. 4, together with a contribution of Rs. 25 per acre, was ordered by Government in January 1917 on lands selected for hot weather irrigation in blocks. Representations were received from certain land-holders affected by this order praying for a revision of the order. The question was therefore referred to a Committee of official and non-official gentlemen whose report has been received and is under the consideration of Government. An early decision has to be arrived at as a special staff of officers and subordinates have collected all the information necessary to introduce the new system and are awaiting orders on the subject. During the next three years, an area of about 7,000 acres can be brought under sugarcane cultivation under the seven existing canals below the reservoir, with the aid of the storage secured in the first stage.

The improvements needed to the existing channels are estimated to cost Rs. 7·5 lakhs and, when the scheme is fully developed, an additional net revenue of over half a lakh of rupees may be expected from this source.

3. RESERVOIR WORKS—FINAL STAGE.

17. In the second or final stage of the project, the dam has to be raised to 124 feet with the full supply level of the reservoir at 118 feet above bed, the net storage at this depth being 37,080 million cubic feet. A high level canal, taking off at 60 feet above the river bed, will be constructed in the first instance up to the Shimsha river, a distance of about 50 miles from the reservoir. The extent of new irrigation proposed under this canal, out of a total command of about 400,000 acres, is about 120,000 acres, besides an additional 25,000 acres under existing tanks which will pen up much of the surplus flow and leakage from the irrigated area. The bulk of this area will lie, in the Mandya and Malvalli Taluks, beyond the ridge dividing the Cauvery and the Shimsha Valleys. The canal will have to cross this ridge by means of a tunnel for which two fairly suitable sites are available.

Reservoir Dam.

18. The total quantity of masonry to be executed on the dam, as already stated, is about 28 million cubic feet. Of this, 19·15 million cubic feet, or 69·4 per cent of the whole, have been executed. It is proposed to complete the remaining 8·85 million cubic feet by July 1922. The temporary gap left in the centre portion of the dam, at 60 feet above bed, cannot be raised until another temporary weir is made available, for disposing of the floods pending the construction of a permanent weir. This second temporary weir has

to be provided at a level of about 90 feet on the right bank before October next, if possible, and the river gap should be raised in the working season (November 1919 to May 1920). This gap has been in existence since July 1915 and it is not desirable to leave it at the present level much longer. As the masonry gets older and cooled, it will be difficult to make a satisfactory junction between the new and the old work. In recommencing construction of this portion, one or two layers of the old masonry should be dismantled and the surface specially prepared to receive the new work.

Under sluices.

19. In the original report on the project, 24 under sluices were proposed, six of $6' \times 12'$ at 12 feet above, and eighteen of $6' \times 15'$ at 50 feet above, bed. Of the latter, 15 were to be on the right bank and 3, on the left. Eight sluices instead of 6 of the former have been built, as already stated in paragraph 7 above. The latter 15 sluices were intended for discharging floods as well as for preventing accumulation of silt in the bed of the reservior. According to the latest experience in Bombay and elsewhere, the effect of the under sluices on the removal of silt is said to be only local and not general. Under the advice of the late Inspector-General of Irrigation in India, Sir M. Nethersole, it was subsequently decided by Government not to build any sluice at level 50 on the right bank. The three sluices on the left bank, which are intended to keep the high level canal free from silt at its head, will however be retained.

Irrigation sluice.

20. A regulating sluice of three vents, each of $6' \times 12'$, has to be built for the high level canal, which will take off at 60 feet above the bed on the left bank of the river. The gates required for these have been ordered from Messrs. Ransomes and Rapier of England, but owing to difficulties created by the war in Europe there has been considerable delay in getting them. Now that the war has ceased, a further representation should be made to the Government of India to treat the supply of these gates as an urgent matter. Side by side with the irrigation sluices should be provided three turbine sluices to utilise the water power available from the supply delivered into the canal from the reservoir. This aspect of the question does not seem to have received attention till now.

Waste weir.

21. Preliminary designs for the waste weir have recently been prepared. The weir will partly consist of rectangular openings fitted with automatic gates and partly of sluices to be worked by gearing. The latest proposals in respect of the weir design may be briefly stated here.

22. The maximum calculated as well as recorded flood in the river is about 250,000 cusecs. Such a flood occurs once in 30 or 40 years and lasts for about 12 to 24 hours. In recent years there was one such flood in 1882 and another in 1911. In the project for the Madras Metur Reservoir, intended to be constructed across the same river but 120 miles below the present reservoir, provision was made for an overflow of 250,000 cusecs only. It is therefore considered sufficient to provide for a surplus of about 200,000 cusecs, the balance of 50,000 cusecs being allowed

to accumulate in the reservoir by making use of it as a flood moderator. Of this surplus, a flow of more than 50,000 cusecs can be dealt with, whenever necessary, by the scouring and irrigation sluices, as under:—

				Cusecs.
3	Irrigation sluices at level bed.	60 ft.	above the river	7,326
3	Scouring sluices ,,	50 ft.	do	10,530
2	Irrigation sluices ,,	40 ft.	do	2,752
3	Scouring sluices ,,	12 ft.	do	28,800
4	Turbine sluices ,,	50 ft.	do	2,236
			Total ...	51,644

It is necessary to provide for proper escapes and regulators, at the heads of the three irrigation canals, to discharge the surplus quantities indicated above.

The balance of about 150,000 cusecs has to be discharged by the waste weir. Of this, 25,000 cusecs will be dealt with by the automatic gates and the balance by sluice gates fitted with large shutters, some fixed at 80 feet and others at 90 feet above river bed, and all worked by screw gearing.

23. The design of protection works needed below the waste weir to lead the surplus waters safely from a height of 110 feet, is a problem attended with some difficulty owing to the unsatisfactory nature of rock met with on the site of the proposed weir channel. The Madras Government are also interested in the design and His Highness' Government have therefore decided to have the question investigated by a committee of experts.

Raising full supply level of reservoir.

24. It appears advisable to raise the full supply level of the reservoir by 2 feet, that is, from 118, as proposed in the project, to 120 feet. The Government of India had, prior to the commencement of Arbitration, advised this Government to build a larger reservoir, and during the course of the Arbitration Proceedings, the Assessor also thought that the Government of Mysore might adopt this course if they so chose. The exact recommendation in the Assessor's own words may be quoted here:—

"The deficiencies shown in Ma. 37 (3), however, appear to me to indicate that it would improve the project considerably, if it were modified to secure the extra 4,000 to 5,000 million cubic feet, which Mysore state is feasible, by a re-adjustment of their flood escape levels; such a modification together with the slight margin they have in the hot weather supply taken in the working tables as 1,000 cusecs as against 900 cusecs required by the Award, would more than cover all the deficiencies except those of 1899, 1905 and 1908, which, however, would probably be further reduced by the larger opening balances thereby made available, so that their slightly larger reservoir might reasonably be expected to secure the full area or very nearly the full area even in bad years. This modification I should advise the Durbar to consider—advice (*vide* paragraph 25 A) which is in general accord with that previously tendered to the Durbar in respect to this scheme by the Government of India, and is also calculated to modify the Madras objections to the

present scheme and render it acceptable to them, while the Durbar have already signified their willingness to so modify the project should it appear desirable to do so."

25. The Government of India may be addressed in the matter immediately after the arbitration question is finally decided by the Secretary of State. The Madras Government would not object to this step, as all that they are interested in is the proper observance of rules in the matter of passing supplies due to them. *These rules are independent of the size of the reservoir.*

26. Attention may also be paid to providing the amenities needed by visitors to this large lake. His Highness the Maharaja has been pleased to direct the construction of a Circuit House at the lake and a new straight road from Mysore to the Reservoir Dam. The latter has already made good progress.

The provision of a house boat might be arranged for without delay. The railway department may be instructed to open a station at the nearest point on the Mysore-Arsikere Railway, to be named the "Krishnaraja Sagara Station."

Land acquisition and settlement.

27. The additional area coming under submersion at the second stage is about 2,500 acres of wet and garden, and 6,000 acres of dry land. To this may be added the land required for channels, roads and other purposes connected with the upper canal works which may be roughly put down at 3,000 acres. Some 1,500 houses have also to be acquired, in addition, in the villages liable to be affected indirectly by the waterspread of the lake.

28. It is understood that there is a sufficient extent of irrigable land still available under the upper canals to meet the demands of the expropriated raiyats, but should any of the villagers find it inconvenient to go so far, the two low level canals may be extended to bring under irrigation the additional area necessary for the purpose. It is however undesirable to increase the irrigation under these channels, as, owing to their proximity to the old channels and the reservoir, the irrigation will be congested and the areas served are liable to become unhealthy. All surplus lands under the upper canals may be advantageously disposed of by sale.

The requisite extent of dry land may be provided either by disafforesting portions of cultivable waste lands lately included in State Forests, or by throwing open for cultivation a portion of the surplus Amrut Mahal Kavals in the neighbourhood.

29. In all, about 29 villages have to be newly formed and work is said to be progressing on 25 villages, where the raiyats are now building houses. These villages should be made model ones in every respect, and the raiyats should also be induced to build houses according to the model plans recently approved by Government. The water-supply wells should be built on sanitary lines and no reasonable expenditure, necessary to make the villages healthy and attractive, should be stinted.

30. As the land acquisition and settlement work has been going on rather slowly, it is desirable that a senior

Deputy Commissioner should be appointed, for one or two months, to review the work already done in the matter of acquisition and settlement and draw up a programme for completing what remains within a definite period. This step is considered necessary although the officer at present in charge of the operations is carrying on his work satisfactorily.

High Level Canal.

31. It is proposed to take off a high level canal from the left, or north bank of the river, at a level of 60 feet above the river bed. The canal is intended to irrigate about 120,000 acres, of which two-thirds will be under monsoon irrigation and one-third under perennial. An average duty of 70 acres per cusec for the former and 85 for the latter has been assumed. On this basis, the discharge required is about 1612 cusecs. But as it is proposed to irrigate section by section in rotation, the capacity has been fixed somewhat higher, *viz.*, about 2,200 cusecs.

32. The main canal will be approximately 50 miles long for the present and will end in the Shimsha river. The area commanded by the canal up to the Shimsha crossing is about 400,000 acres, or roughly three times the area to be brought under irrigation. The lands commanded by the first section of the canal, between the reservoir dam and the Hulikere-Karighatta range of hills, are not so well suited for irrigation as those beyond the ridge. It is therefore proposed to commence irrigation only from beyond the point where the canal crosses the ridge.

33. When the project estimates were prepared, a rough preliminary survey of the canal line had been made. A detailed survey has been in progress for the last three years. Estimates for the section up to the end of the tunnel are now ready. The main canal section beyond this point and the distributary channels (about 150 miles in the aggregate) are under survey. Plans and estimates for these, in detail, as well as for all cross drainage works, road bridges, cattle crossings, foot paths, etc., remain to be prepared.

34. It is desirable to divide the entire area to be irrigated into 10 or 12 divisions, following the natural drainage lines, and to fix the bed and full supply levels of the canal at the head of each division. These Divisions should be marked out and the levels fixed at once. The rest of the work will all be matters of detail.

Tunnel across the Hulikere saddle.

35. It is proposed to take the canal across the Hulikere-Karighatta range of hills by means of a tunnel about $1\frac{3}{4}$ mile long. There is another site for a shorter tunnel at a place called Algod lower down the same hill range, but its adoption will slightly increase the length of the canal. Another alternative proposal would be to skirt round the entire hill range. But on account of the steepness of the hill slopes towards the lower or river end, this proposal is impracticable. Which of the two tunnel sites referred to above should be preferred requires further examination. A decision should be reached in this matter, with the least possible delay, as on it will depend the designs for the entire canal system.

36. An accurate estimate of the cost of the tunnel should be made by a study of the operations on similar

When the factors have been finally fixed, tables of discharges for the sluices and for the weir, for every foot of reservoir level, have to be prepared and printed for easy reference. Similarly, regulation tables showing the quantities to be impounded and passed on to Madras under different conditions of flow in the river should also be prepared.

39. As soon as the discharge curves determined from the joint gauging observations are approved by both the Governments, arrangements should be made to obtain and install discharge integrators at each station, as required by the rules. Necessary arrangements should be made to carry out all these works promptly, so that the rules framed by the Arbitration Committee may be scrupulously observed. The preliminary set of rules now printed, which apply to the construction period, has to be revised, and detailed instructions drawn up and printed for the guidance of our officers and staff.

40. This is more or less a political question, and the operations should be regulated with scientific exactitude, and checks and counter-checks thoroughly maintained. Government should also arrange to satisfy themselves, by independent checks, and quarterly or other periodical reports, that everything connected with gauging and regulation is done in a systematic manner and in strict accordance with approved rules.

5. DEVELOPMENT—CAUVERY VALLEY IRRIGATION.

41. In paragraphs 33 to 39 of the original report on the project, a description of the nature of irrigation proposed under this scheme is given. Briefly stated, the recommendations there made are :—

Block System of Irrigation.

(1) Rice, sugarcane and garden being the principal crops to be grown, intensive irrigation over continuous areas as now practised in the State should be avoided. Not more than one-third of the area commanded should be actually irrigated.

(2) The irrigable area should be marked out in blocks of from 60 to 300 acres in extent to arrange for a suitable crop rotation.

This system, known as the "Block System", has been brought into operation below the Marikanave canals and its introduction under some of the Cauvery channels has recently been approved by Government.

In the Bombay Presidency where it was first introduced, the system has proved highly beneficial both as regards production and revenue and the health of the irrigated tract.

42. The duty under the existing channels in Mysore is at the present time very low, being about 25 to 30 acres per cusec and, as a result, the irrigated tracts are generally rendered unhealthy by water-logging. This arises from there being little or no control over the regulation except perhaps at the channel head sluice. The duties to be worked to under the new canals are taken at an average

Duties proposed and scientific regulation.

of 70 for monsoon crops and 85 for perennial crops and these can only be realised by exercising strict control over the regulation of water. In addition to proper regulation at the head of the main canal, adequate provision should be made for separate control at the heads of distributaries and sluice outlets, so that the discharges might be regulated at every point with scientific precision, in proportion to the extent and nature of crops to be irrigated.

43. It is necessary that the cultivators also should be educated to use the water economically and scientifically and, in the case of summer or perennial crops, by rotation. A beginning in this direction should be made under some of the existing channels and the newly opened low level canals below the reservoir, particularly in connection with the introduction of the block system of irrigation on these channels, already approved by Government. It may be practised also on the tanks under the control of the Irrigation Division.

Irrigation Act.

44. As a large tract of new irrigation has to be administered, it is very important that the passing of the Irrigation Act, which is now ready in a fairly complete form and under the consideration of Government, should be expedited. In the interests of revenue, if for nothing else, the early passing of this Act is imperative.

Levy of contribution.

45. According to the figures given in Appendix I, it will be found that the canal is expected to cost about Rs. 160 lakhs. The present value of the dry land likely to be irrigated by the canal, which may be taken as ranging from Rs. 50 to 100, may be expected to rise to about Rs. 500 immediately after the canal is opened, and to Rs. 1,000 or more in ten years' time. There is no reason why a proportionate share of this increase should not come to Government in the shape of contribution. According to existing practice in the State, the contribution may be taken at one-third to one-fifth of the increase in land value and, on this basis, Government will be quite justified in levying a minimum of Rs. 100 per acre on all dry lands in the valley selected for irrigation by the new canal. The rate to be levied on old wet lands fed by tanks may be determined by ascertaining, in each case, to what extent local irrigation will benefit after the canal is opened. The great majority of these lands do not at present enjoy summer supply, and in all cases where such supplies can be given, it would be justifiable to levy contribution, say, about Rs. 50 per acre, *i.e.*, half that recommended for dry land.

As roughly about one-third of the land under each distributary will be selected for irrigation, there will be much competition among the cultivators as to who should get in first. Far from there being any reluctance, the cultivators will only be too eager to obtain the benefits of irrigation to their lands by readily paying the contribution demanded. This payment may, if necessary, be spread over a period of, say, five years.

Acquisition of lands.

46. When land is being acquired for the main canal and distributaries, it would be prudent also to acquire simultaneously the land required for roads, drainage channels and new villages, as well as for model farms, factories, etc., so that

no extra cost may be incurred at a later stage on account of the resulting enhanced value of land.

Large estates.

47. All Government waste land that can be irrigated will doubtless be disposed of by auction sale. In doing this, however, encouragement should be given for the formation of large landed estates, which should, as far as possible, be impartible. Such estates will facilitate efficient and economical cultivation of land and will enable profitable agriculture of a very high order to be practised, of which we have no conception at present.

6. HYDRO-ELECTRIC POWER DEVELOPMENT.

48. In the report on the project, a storage of 6,352 million cubic feet, out of a net storage of 37,080 million cubic feet in the reservoir, has been allotted for power generation. This is based on a constant supply of about 900 cusecs required at Sivasamudram, making due allowance for normal river discharge. According to the award of the Arbitration Committee as confirmed by the Government of India, this constant flow of 900 cusecs has to be maintained at Sivasamudram. The generating plant can now use 750 to 800 cusecs when the entire plant including the V installation is working. The Station capacity may be enlarged so as to utilise 900 cusecs but not more. With this flow, power to the extent of (900×28=) 25,200 H. P. can be generated, that is, 2,550 H. P. more than the present maximum capacity. The Kolar Gold Mining Companies have recently asked for a supply of power for hoisting purposes. It is expected that this will bring in a large demand within the next two or three years. Industries are also fast springing up in Mysore and Bangalore Cities and there is every reason to expect that the additional power will be bespoken even before it is actually made available.

Alternative schemes for future development of power.

49. It is understood that Mr. S. G. Forbes has recently submitted proposals for a VI installation at Sivasamudram for generating an additional 10,000 H.P. at a cost of about Rs. 40 lakhs. It is for consideration whether it is wise to make piecemeal additions to the present installations in this way or to project works for the additional power needed on a new and wider basis altogether.

There are two sites besides Sivasamudram where new power stations can be installed in the Cauvery Valley, *viz.*, (1) at the Shimsha Falls, and (2) at the Mekedatu Falls. Rough schemes have been prepared for both these installations.

Shimsha Scheme.

50. The possibilities at Shimsha are great. As the height of the fall there is at least 1·6 times that at Sivasamudram, the same quantity of water can generate 1·6 times the power. As stated in paragraph 43 of the original report, there will, in future, be considerable flow in the Shimsha river due to leakage from the large extent of new irrigation under the high level canal. This flow, which would otherwise go to waste, can be best utilised by harnessing the Shimsha Falls. In view of the greater height of fall here, the

cost per installed horse power will be much cheaper than at Sivasamudram. Prior to 1911, preliminary investigations were carried out by Mr. H. P. Gibbs, the late Chief Electrical Engineer, for generating power at Shimsha with the aid of Cauvery water, which was to be carried from Sivasamudram to the Shimsha site by a canal and duct about 11 miles long. The cost of generating about 40,000 H. P. was estimated by Mr. Forbes in the year 1916 at Rs. 67½ lakhs, that is, Rs. 169 per installed H. P., against Rs. 450 per H. P. at Sivasamudram. The Shimsha scheme should be seriously examined at the present stage before committing Government to any further additions at Sivasamudram. Mr. Forbes himself has recommended this course in a paper read at a session of the Mysore Engineer's Conference held in March 1916.

Mekedatu Scheme.

51. If, however, it is thought that there is not sufficient demand for power to immediately justify the somewhat heavy expenditure on the Shimsha installation, there is another site lower down the river for a much smaller scheme which has some special features to recommend it. Some four years ago, the late Mr. T. Arunachala Iyer, Assistant Engineer, suggested the utilisation of the rapids at Mekedatu for generating power. Later investigations have shown that a net height of nearly 140 feet will be available at about 4 miles below the Arkavati junction. Mr. Forbes has worked out a scheme for generating 8,000 H. P. at this site at a cost of about Rs. 30 lakhs, or Rs. 375 per installed H. P. This rate is also less than the corresponding figure for Sivasamudram.

Another advantage of this scheme over the proposed VI installation at Sivasamudram is that no additional water will be required from the reservoir, as the same supply as is now used at Sivasamudram will be available also at Mekedatu except perhaps for slight losses in transmission, while further additions at Sivasamudram will mean extra issues of water from the reservoir.

The Mekedatu scheme has also the additional merit that it will be unaffected when, later on, the Shimsha scheme replaces Sivasamudram, as it can be worked in conjunction with either.

Kabbini Reservoir.

52. Though with a view to an early settlement of the entire question, His Highness' Government have expressed a desire to accept the decision of the Government of India in the Cauvery Arbitration Case, it may be mentioned that this decision is not equitable to Mysore in respect of the ruling relating to the season, February to May, when we are required to pass a constant flow of 900 cusecs *whether needed for power generation or not*. The Assessor has tried to justify the ruling on the ground that the average flow of the Kabbini and the Cauvery combined amounts to over 1,100 cusecs at Sivasamudram in this season. This, however, ignores the fact that a varying flow cannot be converted into a constant flow equal to the average without adequate storage. There is as yet no provision for storage on the Kabbini. As the average is based both on the Kabbini and the Cauvery discharges, it is desirable to construct a reservoir across the Kabbini as early as possible. Surveys are now in progress and, as a

reservoir undertaken for power alone may not pay, it is desirable to combine irrigation with it.

53. The outlines of a comprehensive scheme should be settled before undertaking any further development of power, so that whatever work is done at present might fit in with, and further the intentions of, such a scheme. Judged from the information at present at our disposal, the ideal to be kept in view seems to be this. The Shimsha site should be utilised as soon as possible, so that advantage might be taken of the greater height of the fall in working with stored water. The Mekedatu Falls should be harnessed even earlier, because by its means we shall be using the same water twice over. The present installations at the Cauvery Falls at Sivasamudram, when replaced by the Shimsha installation, might be worked for 7 or 8 months in the year when there is generally a surplus flow in the river, the power generated being used for industrial or other purposes, such as the manufacture of cyanamide, which do not require a continuous supply. A reservoir on the Kabbini will help to work both the Sivasamudram and the Shimsha installations.

54. All these schemes when developed ought to give an aggregate amount of power not far short of 100,000 H. P. The chief point to remember is the order in which each of these schemes should be taken up for execution. It is also imperative that every step taken should be under the best technical advice available, and there should be no hesitation to spend money on obtaining expert advice from two or three sources, if necessary, before undertaking execution.

The production of cheap power is a very necessary step towards the expansion of industries in the State. Owing to the scarcity and increase in the cost of fuel, people all the world over are becoming alive to the importance of developing hydro-electric power wherever available. The Government of India and many leading foreign States are taking active steps and have appointed special development agencies for the purpose. It is therefore satisfactory that we have made adequate provision, thus early, for generation, with the aid of the reservoir storage, of hydro-electric power to meet the demands of the State for at least a decade to come.

7. FINANCIAL RESULTS.

55. The capital cost of all the works described above as given in Appendix I of this memorandum. It will be seen therefrom that the reservoir, canal and power works all combined, were first estimated to cost Rs. 253 lakhs. The total of all estimates, since partly sanctioned and partly approved by Government, for these works as well as other necessary additional works, aggregates Rs. 317 lakhs. According to the latest calculations, however, these figures would appear to require revision and the total cost before completion may probably exceed Rs. 400 lakhs. It is expected that a sum of over Rs. 120 lakhs can be realised in the shape of contribution from dry land converted into wet, and sale proceeds of Government waste land, and about Rs. 10 lakhs from the value of surplus materials and tools and plant left after completion of the

works. The net cost of the works to Government, as shown in Appendix I, will be roughly Rs. 292 lakhs.

56. The return expected on this outlay is Rs. 13·5 lakhs from irrigation and Rs. 14·25 lakhs from power supply, or a total of Rs. 28·75 lakhs, as detailed in Appendix II. This gives a return of nearly 10 per cent on the outlay.

In calculating the returns, water rates of Rs. 10 and 20 per acre, respectively, are assumed for monsoon and perennial crops. The latter rate may at first sight appear to be somewhat high; but considering the character of irrigation and the guarantee of supply from the reservoir, it is by no means excessive. Under the Nira canal in Bombay where such irrigation is practised, the prevailing rate for perennial crops, which at one time was Rs. 10 or 15 per acre, has, within the past 15 years, been raised to Rs. 50 per acre. The yield from sugarcane in this region is sometimes as high as Rs. 900 or 1,000 per acre per annum. By the use of rich manures and the adoption of scientific methods of cultivation, the yield per acre of sugarcane, which is now Rs. 150 to 300 in the Cauvery Valley, may be considerably increased.

57. Apart from the direct returns shown above, the State revenue will increase in several indirect ways. An irrigation of 125,000 acres with the aid of stored water will mean a produce valued at Rs. 1½ to 2 crores per annum to the people. The growth of produce on such a large scale will also lead to the starting of several agricultural industries, such as, milling rice and manufacture of jaggery and sugar, and will help generally to multiply the industries and occupations of the people.

The direct money return to Government will therefore give a very inadequate idea of the numerous ways in which the reservoir and the canal works will benefit the country.

58 The revenue from power is calculated on a total output of 25,000 H.P. only. But by utilising the Shimsha and Mekedatu Falls, the storage will, after satisfying the needs of irrigation, suffice to generate power up to an aggregate of 50,000 H.P. in the Cauvery Valley, *i.e.*, more than double the total present output at the Sivasamudram power station. The return of Rs. 28·75 lakhs or 9·84 per *cent.* based partly on the present developments, should therefore be considered a very conservative estimate.

8. POINTS REQUIRING SPECIAL ATTENTION.

59. In the foregoing pages, various suggestions have been made to ensure the satisfactory completion of the Krishnaraja Sagara Reservoir and subsidiary works and the development of irrigation and power supply in the Cauvery Valley. The more salient points requiring special attention may be summarised as under:—

(1) The rules framed by the Arbitration Committee for the regulation of supplies at the Reservoir should be most scrupulously observed. A system of checks and counter-checks should be regularly enforced.

(2) The design for the waste weir should be settled, at as early a date as may be practicable, and the dam raised to the full height by July 1922.

(3) An immediate decision is required as regards the selection of one of the two alternative tunnel sites available, and the bed and full supply levels should be fixed at the heads of all the principal distributaries in the entire area to be brought under irrigation.

(4) The people of the villages submerged should be satisfactorily settled in the new areas where lands have been allotted to them. It is important that they should not be left to themselves and allowed to drift.

(5) As soon as the decision of the Secretary of State on the Cauvery case is received, work on the main canal should be commenced and vigourously pushed on, so that the money already spent may bring in a speedy return.

(6) Irrigation over extensive continuous areas, as in the deltas, or under the anikat systems within the State, should be carefully avoided. There will be little or no silt in the stored water and a large proportion of irrigation here will comprise perennial crops. The principles of the block system of irrigation should be adopted, in order to avoid injury to the lands by water-logging, and to the population by malaria, and also to encourage the profitable cultivation of sugarcane.

(7) Although sugarcane cultivation is familiar to him, the Mysore raiyat has not learnt to practise scientific methods of cultivation or the use of rich manures which yield large profits. Steps should be taken to train the raiyat in these respects and to stimulate co-operative enterprise for agricultural purposes.

(8) Scientific methods of regulation of water should be adopted by exercising strict control over the canal supplies from head to tail. The cultivators should also be trained in the economical use of water.

(9) The Irrigation Act, of which a draft is ready, should be passed as early as possible to enable the officers to control irrigation on scientific lines.

(10) The full possibilities of power development in the Cauvery Valley should be examined and the policy in regard to the same determined, before sanctioning further piecemeal additions to the installation at Sivasamudram.

(11) The designs for the further development of the project, and detailed designs for works included in the project, should both be well in advance of construction. A special report should be obtained and placed on record once a year in the month of July or August.

(12) Similarly, arrangements for financing the works, according to the capital expenditure indicated in Appendix IV or other approved programme, should be prepared in advance and reviewed once a year at the time of the annual budget.

9. OFFICERS ASSOCIATED WITH THE PROJECT.

60. Before concluding this memorandum, it is but fitting that I should mention the names of the principal officers who have rendered valuable services on this work.

Mr. Karpur Srinivasarav, B.Sc., L.C.E., (Rajasabha Bhushana) as Chief Engineer of the Public Works Department, directed the operations connected with the foundation work, particularly the river diversion during construction, the final closure of the river gap and the raising of the dam to the height necessary for guaranteeing power supply to the mines by July 1915. As the Mysore representative in the Cauvery Arbitration case, he rendered meritorious service, and his able presentation of the case for the Government before the Aribitration Committee has received recognition. In this work, he was assisted by Mr. M. G. Rangaiya, B.A., B.E., who first as Assitant to the Chief Engineer and then to the Dewan, has given valuable help.

On Mr. Karpur Shrinivasrav's retirement in December 1917, Mr. S. Cadambi, B.A., L.C.E., as Chief Engineer, had the general supervision of the work until relieved by Mr. K. Krishnaiengar.

Mr. K. Krishnaiengar, B.A., L.C.E., (Rajasabha Bhushana, Rao Bahadur) has been in charge of the Cauvery Valley Irrigation as Chief Engineer, from July 1918. As Joint Public Works Secretary and in other capacities, he has been in close touch with the prosecution of the scheme and his advice and assistance were often sought both in respect of the Cauvery Arbitration case and the construction of the reservoir and allied works.

Mr. B. Subba Rao, L.C.E., (Rajasilpa Visarada) was the Officer who has had most to do with the scheme from the commencement of the surveys as Executive Engineer in 1910, until he retired as Chief Engineer in charge of the Krishnaraja Sagara Works in 1918. As the direct supervising officer, he was responsible for carrying out the most difficult portion of construction work and the conspicuous service rendered by him in this respect has received special recognition.

Mr. B. B. Garudacharya, L.C.E., was the officer, next only to Mr. B. Subba Rao, responsible for the construction of the dam and has a record of devoted and enthusiastic service. He relieved Mr. B. Subba Rao, of the charge of the reservoir on the latter's retirement in June 1918.

Mr. K. R. Sesha Char, B.A., B.E., rendered valuable service first as Assistant Engineer in direct charge of the surveys and preparation of the project, subsequently as Assistant to the Chief Engineer and then as Executive Engineer on the masonry dam and latterly on the surveys and preparation of estimates for the high level canal project.

61. The other officers who have done useful service are Mr. K. Anantacharya, L.C.E., Mr. Y. Asvathanarayana Rao, B A., B.C.E., Mr. A. Puttasamaiya, B.A., L.C.E., the late Mr. T. K. Arunachela Iyer, M.E., Mr. R. W. Scaldwell, Mr. N. Sarobhoja, L.C.E., and Mr. B. C. Ketkar.

Among the junior officers, the following names deserve special mention :—

Mr. V. V. Patankar, B.A., L.C.E., Mr. L. A. H. Winckler, A.C.G.I., Mr. G. Seshagiri Rao, L.C.E., Mr. Y. Ramaswamy, B.A., B.E., and Mr. K. Venkataramaiya, B.A., C.E.

62. Among officers outside the Department, it is necessary to place on record the valuable service of Mr. S. G. Forbes, B.Sc., M.A.I.E.E., Chief Electrical Engineer, who carried out, with much ability, the IV and V installation works at Sivasamudram simultaneously with the progress of the reservoir dam.

The late Mr. L. Krishna Rao of the Revenue Department deserves special mention for his original suggestions and organization in that most difficult work, namely, land acquisition and settlement of the expropriated raiyats. He was succeeded by Mr. Dharmaraj Chetty whose work has also been characterised by industry and zeal.

10. CONCLUSION.

63. The reservoir is the largest irrigation project yet undertaken in the State and, as a direct result of its construction, high class irrigation will be increased by 150,000 acres, and sugarcane industry doubled in extent, and trebled or quadrupled in point of production. The power supply from the Cauvery Falls, which till recently was about 12,000 H. P., is being nearly doubled, and the works will pave the way to a further increase up to 50,000 H. P. and eventually to 100,000 H. P.

64. I stated in the original report that the scheme opened up "a vista of possibilities of ever increasing value to the State." The works have maintained this character and begun to pay. They have already begun to earn for the State a gross revenue of Rs. 10 lakhs and a net revenue of Rs. 7 lakhs per annum. In due course, they may be expected to add annually, to the productive power of the people, Rs. 2 crores in the shape of direct agricultural produce, and 5 crores eventually, including the indirect results from the devolopment of industries and manufactures. An idea can be formed of what this means, as an addition to the normal resources of the State, if we remember that the entire production of the Mysore State at the present time is estimated at Rs. 18 to 21 crores per annum.

65. The Cauvery Power is one of the main sources of the prosperity of the Kolar Gold Mines. It has added to the resources and amenities of life in the Cities of Bangalore and Mysore. Very soon, we may be working suburban railways on the Kolar Gold Field, and tramways in Bangalore, Mysore and up the Chamundi Hill. Pumping by electric power for irrigation is also within sight.

66. The aim of every civilised administration, in these days of after-war reconstruction, is to increase production by means of agriculture and industries. The present scheme admirably fulfils these objects. It will make large additions to the food supply, produce raw materials for industries, promote manufactures and quicken industrial life and commercial enterprise among the people. It will, in due course, exert a potent influence on the material well-being of the State. As such, the prosecution and early completion of the scheme should be a matter of special solicitude on the part of His Highness' Government.

APPENDIX I.

ESTIMATES OF CAPITAL COST AND MAINTENANCE.

A. Capital Cost.

	Rs. Lakhs.
I. As given in the original report on the project—	
(1) Reservoir Dam	139·0
(2) Canals	106·0
(3) Power Development	8.0
Total ...	253·0
II. As per approved estimates—	
(1) Reservoir Dam	161·5
(2) High Level Canal	115·0
(3) Two Low Level Canals	2·3
(4) Improvements to the existing channels below the Reservoir	7·5
(5) Power generation at the Reservoir ...	10·0
(6) Fourth installation at Sivasamudram ...	21·0
Total ...	317·3
III. *As anticipated under the revised proposals.—*	
(1) Reservoir Dam	205·0
(2) High Level Canal	160·0
(3) Two Low Level Canals	3·5
(4) Improvements to the existing channels below the Reservoir	7·5
(5) Power generation at the Reservoir ...	10·0
(6) Fourth and Fifth installations at Sivasamudram	26·0
(7) Further additions needed to increase the out-put of power from 22,500 H. P. to 25,000 H. P.	10·0
Total ...	422·0
Deduct contribution and sale proceeds of waste land and of old materials (Rs. 120 lakhs and Rs. 10 lakhs, respectively)	130·0
Net capital cost ...	292·0

B. Cost of Maintenance.

	Rs. Lakhs.
(1) Maintenance of irrigation works... ...	3·0
(2) Maintenance of power works at Sivasamudram including working expenses, depreciation, etc., at 25 per cent of the gross earnings ...	4·5
(3) Working expenses for power generation at the Reservoir	0·5
Total ...	8·0

APPENDIX II.

ANTICIPATED RETURNS.

	Rs. Lakhs.
Net cost of project as per Appendix I	292·0
I. Revenue from Irrigation—	
(*a*) From 85,000 acres of monsoon crops at Rs. 10 per acre	8·5
(*b*) From 40,000 acres of perennial crops at Rs. 20 per acre	8·0
Total ...	16·5
Deduct for maintenance ...	3·0
Net revenue from irrigation	13·5
II. Revenue from Power—	
(1) Additional power rendered possible at Sivasamudram by the construction of the reservoir, 12,000 H. P. at £10 or Rs. 150 per H. P. per annum	18·0
Deduct working expenses, depreciation, etc., at 25 per cent of gross revenue	4·5
Net revenue from power Total ...	13·5
(2) From power generated at the reservoir (average of about 1,500 H. P. at Rs. 150 per H. P. per annum)	2.25
Deduct working expenses	0·5
Net income	1·75
Total income from power (1) and (2) ...	15·25
Total revenne from irrigation and power (I and II) ...	28·75

This, on a net outlay of Rs. 292 lakhs, will give a return of 9·84 per cent.

N.B.—The extra annual revenue derived from power at the rate of £2 per H. P. on the guaranteed power is not included as it will be realised only till July 1925.

APPENDIX III.

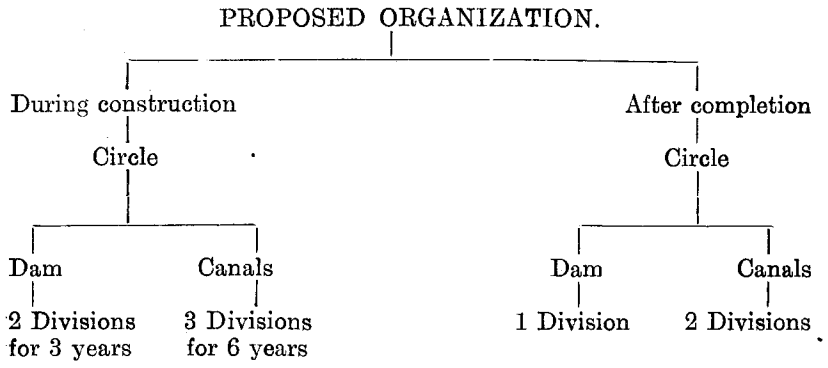
FUTURE ORGANIZATION.

The existing Superintending Engineer's Circle will have to be continued till all works relating to the dam and the high level canal are completed. Two more divisions in addition to the one to be transferred from the existing executive charges will be immediately necessary, one for the charge of the tunnel section and the other for the canal section in the Mandya and Malvalli Taluks. These three divisions will have to be maintained for 7 years (*vide* footnote 4, Ap. IV).

After the dam and canal works are completed, the Superintending Engineer's Circle as well as the three executive divisions will have to be permanently maintained. One of the latter will have charge of the regulation at the reservoir dam and the irrigation under the upper channels, with headquarters at the reservoir. The second will be in charge of the first section of the High Level Canal and two new and four old channels below the reservoir, with headquarters at French Rocks. The third will be entrusted with the entire canal system beyond the tunnel, as also three old channels, with headquarters at Malvalli.

The details of the future organization proposed are also shown in the following tabular form :—

PROPOSED ORGANIZATION.



NOTE.—Permanent Divisions will be manned by one Executive Engineer and three Assistant or Sub-Assistant Engineers.

APPENDIX IV.

CAPITAL EXPENDITURE PROGRAMME.

No.	Projects	Sanctioned or approved estimate in lakhs of rupees	Revised or modified estimate in lakhs of rupees	Outlay to end of June 1918, including establishment in lakhs of rupees	Value of works remaining to be done including establishment in lakhs of rupees	Probable expenditure in lakhs of rupees							
						1918—19	1919—20	1920—21	1921—22	1922—23	1923—24	1924—25	1925—26
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Reservoir Dam	161·5	205·0	118·0	87·0	16·50	25·50	22·50	22·50	...	...	...	...
2	High Level Canal	115·0	160·0	...	160·0	...	6 0	20·00	25·00	30·00	30·00	26·00	23·00
3	Two Low Level Canals	2·30	3·5	2·5	1·0	·30	·35	·35	...	...	...	...	...
4	Improvements to the existing channels ...	...	7·5	...	7·5	...	2·5	2·5	2·5	...	...	...	...
5	Power generation at the Reservoir ...	10·0	10·0	...	10·0	...	··	Not provided for.				...	...
6	Sivasamudram—(IV and V Installations) ...	21·0	26·0	25·0	1·0	..	..	Anticipated savings				...	..
7	Further Installations to increase the output from 22,500 H.P. to 25,000 H.P. ...	...	10·0	...	10·0	...	..	Not provided for.				...	...
	Total ...	309·80	422·0	145·5	276·5	16·80	34·35	45·35	50·00	30·00	30·00	26·00	23·00
8	Deduct ryots' contribution and sale proceeds of old materials	5·0	130·00	...	130·0	...	...	...	...	...	...	...	...
9	Net cost	304·80	292·00	145·5	146·0	...	...	...	...	...	...	..	...

WORKS ON RESERVOIR DAM.

1. During 1918-19—the portion of the dam on the north bank will be raised to 102 feet and that on the south bank to 105 feet, above the river bed.
Cut stone work of the sluices will be completed.
Foundations for the weir will be filled in to some depth, if the details of design are promptly settled.
Land Acquisition operations will be pushed on.
2. 1919-20.—Excavation of foundations for the remaining length of the dam on the north bank will be pushed on and the dam already constructed on the flanks will be raised to 105 feet
Sluice work will be completed in all respects. The weir will be brought up to 90 level. After the monsoon is over, the closure of the river gap will be taken in hand.
3. 1920-22.—During the next two years, the dam for the entire length will be brought up to level 124. The waste weir works will also be completed including the erection of gates.
Works on the Reservoir Dam are expected to be completed in all respects by June 1922.

HIGH LEVEL CANAL PROJECT.

4 One year will be required for the preliminary preparations and six years for the completion of the work. If the project is sanctioned by June 1919, it can be completed by June 1926.

W D 1377—30-1-19—200.

PLATE I.

KRISHNARAJA SAGARA RESERVOIR

RESERVOIR AND CAUVERY VALLEY CANAL SYSTEM

Scale 8 miles = 1"

Hassan. Kunigal. Magadi.

MYSORE. HEMAVATI RIVER. Arkalgud. Hole-Narsipur. ARSIKERE. Mandagere. Nagamangala. Krishnarajapete. Closepet. RAILWAY. Chennapatna.

SHIMSHA BRANCH. KERAGOD DISTRIBUTARY. MADDUR DISTRIBUTARY. TUNNEL. SHIMSHA RIVER. BANGALORE. Maddur. Akkihebbal. Chinkurli. Hosa-Agrahar. Saligram. CAUVERY. Mandya. CAUVERY BRANCH. MYSORE BRANCH. LOKASARA DISTRIBUTARY. HEBBAKAVADI DISTRIBUTARY. RESERVOIR. French Rocks. Yedatore. Seringapatam. TRANSMISSION LINE. RAILWAY. Malvalli. Periyapatna. Yelwal. Hunsur. BELAKAVADI DISTRIBUTARY. POWER STATN. K. G. F. Mysore. MYSORE. TRANSMISSION LINE. Sivasamudram. LAKSHMANATHIRTHA RIVER. M. & S. W. RY. LINE. NANJANGUD RIVER. T. Narsipur. KABINI RIVER. Heggaddevankote. Nanjangud.

REFERENCE.		
1	*Krishnaraj-katte*	*Anicut*
2	*Chamaraj*	*do*
3	*Chunchin-katte*	*do*
4	*Chikka Devaroy Sagar*	*do*
5	*Devaroy*	*do*
6	*Virajanadi*	*do*
7	*Ramaswami*	*do*
8	*Rajaparameswari*	*do*
9	*Madhava-Mantri*	*do*
10	*Sivasamudram*	*do*
11	*Sree Ramadevar Dam*	
12	*Mandagere*	*do*
13	*Hemagiri*	*do*
14	*Marchalli*	*do*
15	*Sagarakatte*	*do*
16	*Kulhalli*	*do*

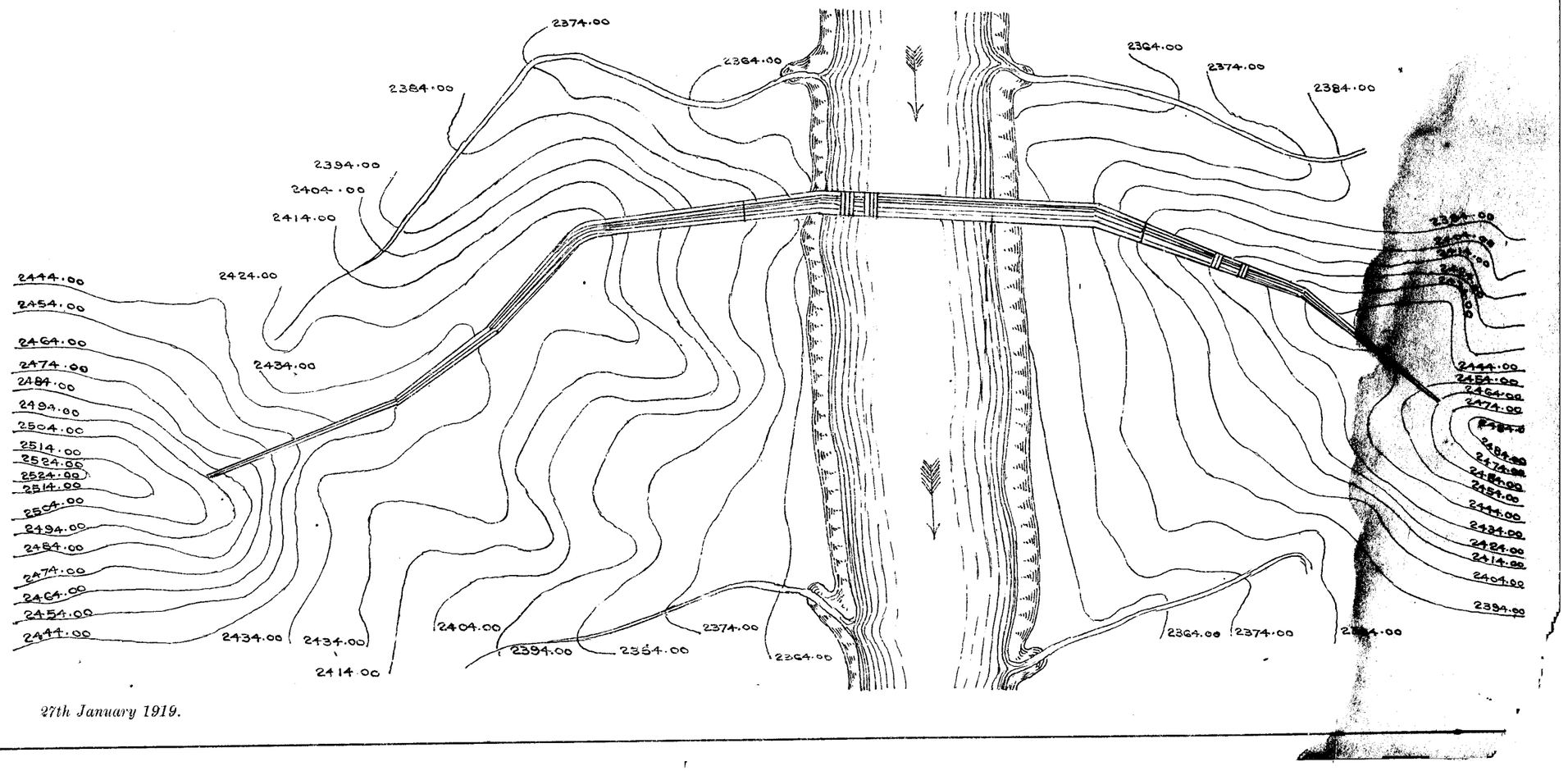
NOTE.
EXISTING CHANNELS IN BLUE.
PROPOSED CANALS IN RED.

27th January 1919.

KRISHNA RAJA SAGARA RESERVOIR.

PLAN OF DAM.

Scale 800′=1″



27th January 1919.

KRISHNARAJA SAGARA RESERVOIR

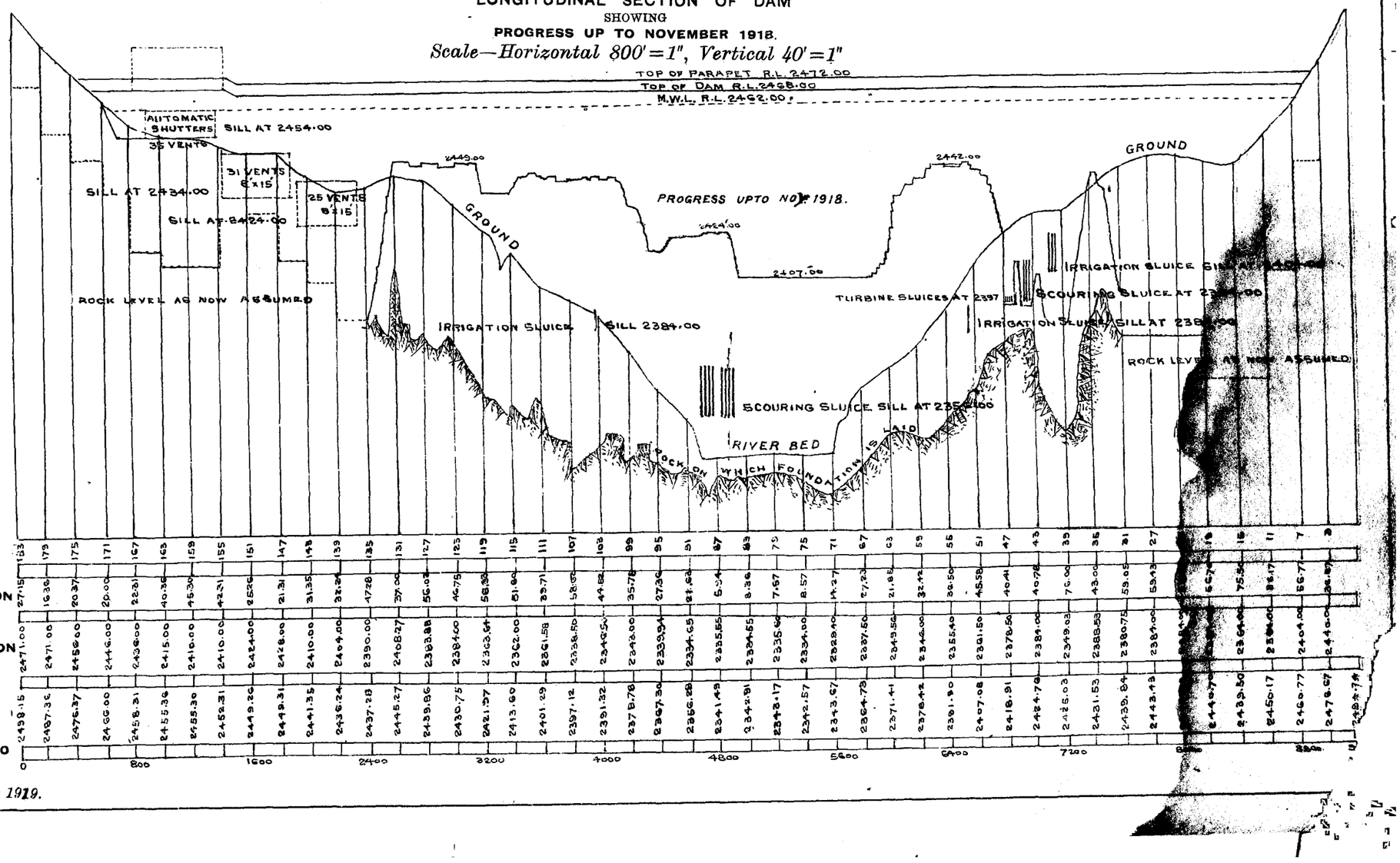
PLATE III.

LONGITUDINAL SECTION OF DAM

SHOWING

PROGRESS UP TO NOVEMBER 1918.

Scale—Horizontal 800'=1", Vertical 40'=1"



| | | |

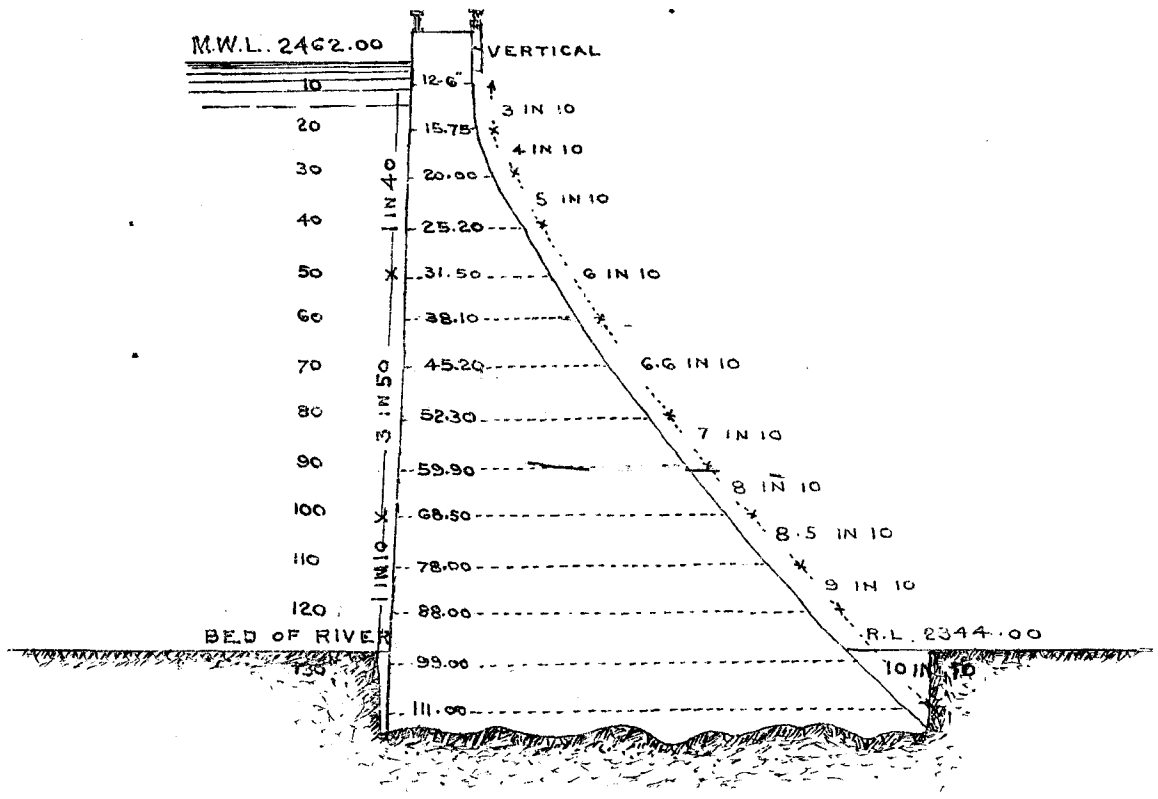
PLATE IV.

KRISHNA RAJA SAGARA RESERVOIR.

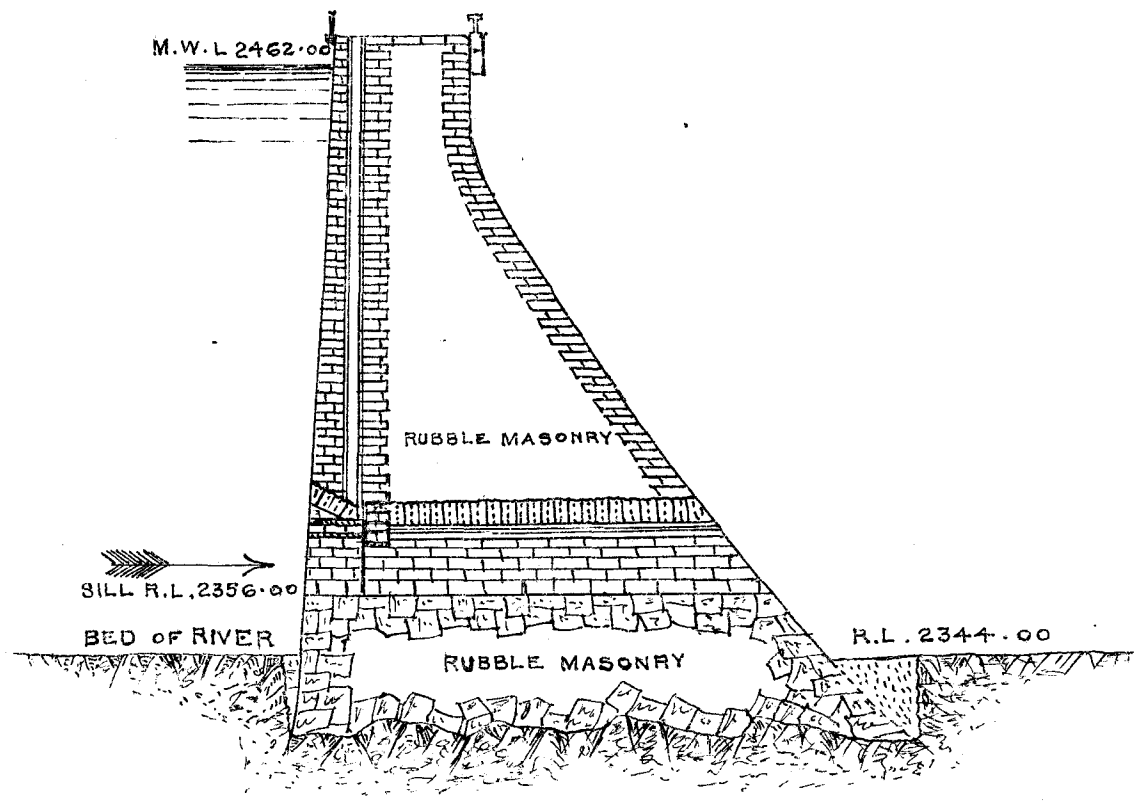
SECTIONS OF DAM.

Scale—40′ = 1″

GENERAL PROFILE.



CROSS SECTION THROUGH A SLUICE.



27th January 1919.